

**We claim:**

1. A fiber optic sensor for detecting a physical condition, the fiber optic sensor comprising:

a lead fiber having a first end and a second end;

5 a first partial mirror on the second end of the lead fiber;

a sensor fiber having a first end and a second end, the sensor fiber having an optical path length which varies in accordance with the physical condition;

a second mirror on the second end of the sensor fiber; and

10 a connector for connecting the second end of the lead fiber to the first end of the sensor fiber to provide an optical coupling between the second end of the lead fiber and the first end of the sensor fiber through the first partial mirror.

2. The fiber optic sensor of claim 1, wherein the second mirror is a partial mirror.

3. The fiber optic sensor of claim 1, further comprising a first ferrule on the second end of the lead fiber and a second ferrule on the first end of the sensor fiber, wherein the  
15 connector comprises a sleeve for connecting the first ferrule to the second ferrule.

4. The fiber optic sensor of claim 3, wherein the connector connects the first ferrule to the second ferrule to leave a gap between the first ferrule and the second ferrule.

5. The fiber optic sensor of claim 1, wherein the sensor fiber has a length of less than 10 cm.

20 6. The fiber optic sensor of claim 1, wherein the sensor fiber has a length of greater than 100 m.

7. The fiber optic sensor of claim 1, comprising a plurality of the sensor fibers, wherein the connector connects the second end of the lead fiber to the first end of each of the plurality of the sensor fibers.

8. The fiber optic sensor of claim 7, wherein the connector connects the second end of the lead fiber to the first end of each of the plurality of the sensor fibers at a single location on the lead fiber.

9. The fiber optic sensor of claim 8, wherein the plurality of sensor fibers have  
5 different optical path lengths.

10. The fiber optic sensor of claim 1, further comprising a plurality of additional sensor fibers connected to the lead fiber at locations between the first and second ends of the lead fiber.

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